IMMATERIAL ELEMENTS

THE

IMMATERIAL ELEMENTS:

THEIR

ATTRIBUTES AND RELATIONS.

Newly Discovered Laws and Wonderful Consequences; Truths in Superstition and Errors in Science; Unity, Harmony, Economy; Correlation and Triune Dependence of all things; Missing Links Supplied; Mind, Matter and Force; Time Space and Motion; Mesmerism, Psychology and Astrology; Mans Relation with Lower Animals; Organic and Animal Life, Etc.

BY

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"*Truth crushed to earth shall rise again,*
The eternal years of God are hers,
But Error, wounded, writhes with pain,
And dies amid his worshippers."

BRYANT.

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ERRATA.

Page 28, for "Paralized" read "Polarized.

Page 72, last line for "Mesmerizee" read "Mesmerizer."

TO MY FATHER

Rev. Lyman Sargent,

whose wise counsels have been my chart, and

TO

My Mother,

whose constant affection has been my guiding star in the eventful voyage of Life.

IN TESTIMONY OF FRIENDLY ESTEEM AND VENERATION

THIS WORK IS RESPECTFULLY INSCRIBED BY THE AUTHOR.

PREFACE.

While the hill of science is rough and rugged in comparison with the flowery fields of fiction, in its stern and barren cliffs we find the richest gems of truth that amply repay us for the toil in their discovery.

In the region herein explored I have pointed out not only those features which are clearly perceptible, but ventured to the partially obscure, as one might, while ascending a mountain observe the landscape, not only so far as plainly discernable, but even look beyond the limits of accurate vision, and by comparision of the known with the unknown form some conception of the mysterious fields of the dim and uncertain.

I trust that any false impressions thus received may be dispelled by a higher ascent to which the interest of the subject may impel and hope that

while the space assigned to the work has compelled me to pass streams of speculation only pointing at their source you may follow their intricate windings to the great ocean of truth, the Universal Laws of Nature and that the limits of our explorations so far as herein conducted may prove but the outskirts of a rich region to which we shall advance.

With the wish that you may enjoy the prospect as well as I myself I hope to be pardoned for taking you over so large a field in so short a time and trust you may be no more wearied and no less benefitted than if you had been confined to a single idea.

E. D. S.

Chicago, August, 1873.

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V.

HARMONY.

ERRATA.

Page 76, 11th line supply "and" after "imagination."
" " 12th " for "fore" read "force."
" " 15th " for "fore as" read "forces."
" " 28th " for "bound" read "found."
" 92, 19th " for "reflections" read "inflections."

I.

UNIVERSAL LAWS,

INTRODUCTION—MEANS OF PROGRESS—CONVERTIBILITY—ECONOMY—DEPENDENT TRINITY OF MIND, MATTER AND FORCE—TIME, SPACE AND MOTION.

A RETROSPECT of the progress of science inspires admiration for the achievements of the philosophers of the past, mingled with wonder that mankind should have remained so long in ignorance of important truths.

Science is the parent of art, and that men capable of such attainments as mark the ages of antiquity, and gifted with intellect equal to our own, should have studied astronomy for more than fifty centuries without discovering the form or motions of the earth; that they should kill animals as long, and even dissect human bodies with a view to ascertaining the physiological functions for a thousand years, before discovering the circulation of the blood, are facts which excite profound astonishment.

Reason and experiment go hand in hand in the exploration of the mysteries of the universe. While the ancients believed it possible to solve every problem by the application of logical rules and demonstrate every truth by the reasoning process, the numerous errors which they committed have induced in these latter days a distrust of that method, until now it is required that facts shall be proved by experiment. This is doubtless the true method of investigation and too great credit cannot be given to those who have taken doubtful theories from the realm of speculation and placed them upon an undisputable basis by the test of actual experiment; yet we may rush to the extreme of neglecting the application of trains of thought which if closely and accurately followed will be rich in results.

We should also remember that nature is on every side exhibiting phenomena quite as important in evidence of her laws as any experiments performed in the laboratory of the chemist. It is because the former are open to the observation of all and are never liable to mistake, that they are of greater utility in illustration than the latter, and observation ranks among the most important means of acquiring knowledge. It was this that led our master Sir Isaac Newton to the discovery of the law of gravitation, and other great discoveries own a like origin.

That quality of the universe which we term material is capable of most readily acting upon

the mind through the senses, and perception is the primary step in every mental process. The progress of science is therefore from the material. We acquire knowledge by the comparison of the known with the unknown. By this means the child, who commences with informing himself of the sensible properties of the limited number of objects within the scope of his observation arrives, in later years, to the conception of facts infinitely beyond the utmost limit of his puerile imagination; and the human race, from a limited knowledge of its local surroundings successively attains to a knowledge of the remote parts of the earth, acquires definite ideas of the character, composition and motions of the heavenly bodies, traces the laws of mechanical action, deduces the quantitative relations by the mathematical sciences, reduces matter to its component elements by chemical analyses, and traces the rare and subtle fluids of nature from their origin to their destination.

The chief glory of the human intellect is the ability to connect ideas so as to arrive at conclusions and trace the relations of cause and effect; whereby man from being in infancy the most helpless and dependent of all created beings, is capable of surpassing the limits of knowledge which restrict the unreasoning brute, and attaining to a power and intelligence which so far as we know is without limit.

The mind of the child is capable of receiving and retaining such impressions as arise from the operation of the senses, with the greatest facility, but is, until an advanced period of childhood, incapable of any extended abstract reasoning. The object of this is evident in securing in early life a stock of facts that may be of service in after years. In like manner the early generations of mankind were occupied in ascertaining the plainer qualities of the more gross forms of matter. Advance from age to age has ever been in conformity with a natural law of progress from the plain to the obscure, independent of the importance of the different branches, until now the mentality of the world by the progress of truth having attained to the ability of its just conception, a subject is presented which in relative importance is in advance of all that have preceded it, and which seems likely to occupy a prominent place in the public mind during the twentieth century, namely, the investigation of the Immaterial Elements of the universe.

What will be the practical results of this investigation, time alone must demonstrate, yet when we conceive the comparative importance of these forces in nature and recall the miraculous consequences which in the present century have followed the advance in physics at its commencement, the imagination is forced to the conclusion that they will not be unimportant, but will far exceed all the wonderful discoveries of the past.

Less than two hundred years ago, Joseph Addison expressed the popular estimate of the importance of the natural sciences by saying, "We know water sufficiently when we know how to freeze it, how to boil it, and how to make it run and spout out in what quantity and direction we please, without knowing what water is." Such was the most advanced aim of the philosophy of the age of mechanical research.

Since that time the discovery of the composition of water has laid the foundation for the science of modern chemistry, and the wonderful powers of steam have wrought a revolution in the civilized world. Then he who should have prophesied that men should send intelligence around our globe in one third of a second of time, harness the steam as a steed of such transcendent powers, and even render water capable of serving the purpose of fuel simply by separating that fluid into its elements, would have been fortunate to escape a heretic's doom in an asylum for mad-men. This may be taken as a parallel to recent views of the immaterial forces and Addison has still many tacit equals who believe that we know electricity sufficiently when we know how to derive and dispatch it without knowing what electricity is. Should the inquiries directed to the forces be as successful as we can expect, doubtless many results may be obtained of which we cannot now conceive, but fancy hints at locomotion by light and electricity with

consequent interplanetary intercourse and many minor, and possibly major achievements, for which the discovery of the electric currents, and spectral analysis, are paving the way, while the results to man must be most important as all his better part is immaterial.

The subject of the physical forces leads directly to that of the mental and moral manifestations and serves as the connecting link between the natural and the spiritual. Only by this course can we arrive at a correct and scientific understanding of the more difficult problems of intellectual and moral philosophy, and physiology, and trace the laws governing our higher attributes. Here too results may be effected which if less practical in their nature than in the case of the physical forces, may yet be no less satisfactory and important. The human mind in the pursuit of happiness finds not its richest gems in things of the material world.

We may discover and trace certain laws in the universe which apply throughout every department of matter, force, and our being. These laws when recognized, are of the highest interest and importance.

The epoch of rapid progress and rational advance in the arts and sciences, dates from the discovery of the elementary composition of matter near the commencement of the present century. James Watt, the inventor of the steam engine, Cavendish, and Lavoisier, almost simul-

taneously and quite independently demonstrated the composition of water, two of those gentlemen succeeding in resolving it into oxygen and hydrogen, while the third by the union of those gasses produced it. The principle being thus discovered that matter was capable of changing form, it was soon apparent that in all the changes which matter undergoes no increase or diminution occurs in its quantity, and chemists began to trace those substances which they had conceived to be destroyed, burned up, or dried up, to new forms, and thus advanced from the knowledge of the grosser, to the conception of the more rare and imponderable forms in which matter can exist. This was the first step towards the higher and more immaterial of the universe. This law of economy, and its necessary consequence, convertability, are of universal application. Nothing of mind, matter or force, time, space or motion can cease to be, by any natural process save as it is changed into some equivalent amount of something else, or some other form of itself.

The definition of force, that it is that which produces in matter a change of state whether of motion or rest, is exceedingly defective and inaccurate.

Force may exist in the form of Light, Heat, Electricity, Chemical Affinity, the Attraction of Cohesion, the Attraction of Gravitation, Capillary Attraction, and Vital Force. These have been termed the physical forces, or the forces of

nature. They are one and the same, and only different forms in which force may exist. To this list may also be added Catalysis and Mechanical Motion. Catalysis is that property possessed by certain substances of causing other substances to which they are introduced to take on new affinities, or abandon affinities to which they were otherwise bound. Mechanical motion, or *living force*, is the force of a body in motion, as a falling weight, in distinction from the force with which it presses or draws upon its support, while in a state of rest. These ten forms in which force may exhibit itself are only distinctive in consequence of different reactions with matter. They are identical, in the sense in which water is identical with oxygen and hydrogen, or the diamond with charcoal. It was demonstrated by Count Rumford that the hypothesis of latent heat which had been devised to account for the heat of friction was a fallacy, and that the heat of friction was the result of direct conversion from motion arrested. This principle on further observation was found to apply to the other forms of force. All the so-called forces are correlative and mutually convertable. As in the case of matter this discovery led to the question whether any quantity of force once in existence can ever be destroyed without causing or giving rise to an equivalent amount in the same or a different form, which if again seen in its original state, would appear as the original amount;

whether, in all the changes through which forec passes, if brought to its original point in the circle, it would be found to have lost or gained in its circuit?

When, through the mercy of a kind Providence the attempts of the old alchemists to convert substances to gold and fabricate the elixir of life were proved fruitless, an attempt was made to construct a machine that should be able to supply its own force without receiving an equivalent amount from external sources, and hence capable of continuing its motion perpetually. The mechanical powers were first appealed to for the solution of this problem, but after the discovery, that the power of the lever was not the consequence of a magic influence from the arcs of circles in which the power and weight are moved, but that the lever, and the balance in every form, are subject to the law of compensation, so that a weight of one pound to raise two pounds one foot must itself fall two feet, and that two pounds falling one foot will again raise one pound two feet, no more or less, it was evident that no machine, could create force, but only return what it had received, less the amount converted into heat by friction. It was then found that the other forms of force could be changed to motion, and attempts were made to discover an exception to the equality of cause and effect in the circle of physical forces, but the most arduous efforts have only served to establish the uniform persistence of

force. As in a direct course no force can be gained by changing its form, as from heat to motion, it is evident that in a reverse order nothing can be lost, and as this is true in whatever order the changes are made, it may be stated as equally true with the impossibility of perpetual motion, that force once in existence must continue a fixed quantity forever. Logical conclusions are when the logic employed is correct, quite as conclusive as experiments, but this conclusion resting upon a hypothesis of the impossibility of perpetual motion, it was necessary to the proof of the hypothesis that experiments should substantiate the theory. This has been accomplished. The result of careful experiment demonstrates that a hammer weighing ten pounds falling from a height of one foot upon a bar of iron by 13,500 blows produces heat sufficient to raise the temperature of one pound of water from the freezing point 32 degrees above zero, on Farienheit's thermometer to the boiling point 212 degrees above zero, or 180 degrees.* From these figures it appears that the mechanical equivalent of heat is such that 135,000 pounds falling one foot or one pound falling 135,000 feet is equal to the heat that will raise one pound of water 180 degrees Fah. or what is equivalent, 100 degrees centigrade, or heat sufficient to increase the temperature of a pound of water, 100 degrees centigrade will, when converted to motion or working power, raise the

*Von Liebig in Correlation and Conservation of Force, p. 391.

same weight of water or any other substance 135,000 feet; or heat sufficient to increase the temperature of any weight of water one degree centigrade, will raise the same weight 1,350 feet. The quantitative relation thus established between heat and motion is readily expressed with reference to other forms of force, by taking these as a standard of comparison.

As in the case of matter the admission of the axiom, of its economy forced philosophers to the investigation of the material elements, and the understanding of obscure forms to which they had assigned a spiritual nature, (*gas*, *geist*, *ghost*,) so in tracing force through its various changes, we arrive at a knowledge of its true nature. Force is a strictly immaterial influence, analagous to motion, and traced backward through its changes to its origin, is always found to originate in the light and heat of the sun. Its common origin in all its forms, their mutual correlative convertability, and observation of the cause of its various manifestations by reason of various reactions with matter, demonstrate it to be a unit, consisting of attraction, repulsion, and equilibrium, each dependent upon, and impossible without the others. The laws of economy and convertability first discovered in matter were found to apply to force, and the question now arises whether the law of unity applying to forces is not also applicable to matter?

The discovery of the elementary composition of matter has reduced the infinite variety of compounds or substances, that abound in our world to about sixty-five simple components, which as we know of no means of separating them into other substances, are termed, elements. Of this limited number all but fourteen are quite rare, while four, oxygen, hydrogen, carbon and nitrogen, make the greater part of the animal, vegetable, and æriform products met with in nature. It is evident that every discovery of the non-elementary character of any of these substances must modify their number.

The progress of science ever tends to simplify the complex, or approach the unit.

Examining the qualities which distinguish these so-called elements, we find them to be entirely the effects of different reactions with the various forms of force. Take for example the metal gold, and the gas hydrogen, and it is evident that the only distinction between these antipodes of the scale is in being affected by different degrees, or in different ways by gravitation, cohesion, light, and the other forces if any which give them their qualities.

If we wish for further evidence that aside from the action of force every form of matter is identical let us observe water, affected by a low degree of heat, cohesion and chemical affinity, it is a crystalline solid, more heat makes it a liquid, more still a vapor, and removing chemical affinity

we have two gasses, oxygen and hydrogen. In this case we know the material elements affected to be identical. In like manner reason will convince us that all the distinctive qualities of the elements are but the different effects of forces.

We may therefore assume that the essential element of matter is a unit. Next we observe in force the law or property of immateriality. Let us examine matter as to this property. Take the most material object as a bar of iron; remove from it the operation of the force of gravity and it is without weight, take away the action of cohesion and it is intangible and without form or substance, without light it is destitute of color and invisible, and if these be the only forces acting upon it nothing remains but an abstract principle of matter of which we can have no perception, by itself, as immaterial as force.

The seven essential properties of material objects are Extension Attraction Inertia Divisibility Figure Indestructability and Impenetrability. These are only the result of force, except indestructability, which may be as an abstract conception, a property of matter in its essential essence.

Matter and force are dependent. Matter is that element capable of responding to the action of force, and force is that quality or element capable of acting upon matter, to produce an effect which we recognize as material objects, and which is capable of reaction with the

other element of the triune, the mind. As neither matter nor force can be exhibited except from their action upon each other so mind cannot be conceived to exist independent of them. Without something to think about there can be no thought. One born destitute of a part of his senses, may through the others receive impressions that culminate in ideas, but one born destitute of all senses must forever remain destitute of mentality. The demonstration of the remainder of this dependent trinity of mind matter and force, whereby neither matter or force can exist without mind, constitutes the grandest problem of which man can conceive, and leads to the conception of the origin of all things from the mind of the Infinite.

The law of dependent trinity so strikingly observed in this instance, is a universal law. I will only mention a few examples of it here as exhibiting its claims to be so regarded, Deity, "Three Persons in one God"; man, in his image; the universe; mind; matter and force; mind; perception, reason and the moral quality; perception; consciousness, an object, sensation; reason; every logical conclusion necessitates three premises, as all men are mortal, we are men, therefore we are mortal; moral qualities; faith, hope and charity; moral government; probation reward and punishment; probation; virtue, vice and the power of choosing; virtue; harmony with God, with man, and with our own being; vice; the opposite; power

of choosing; knowledge of good and evil, choice, and ability to act. The departments of state are legislative judicial and executive; of the family father mother and child. Matter exhibits the solid liquid and acriform states; Nature, the animal vegetable and mineral kingdoms, the heavens, sun moon and stars; animal life implies digestion circulation and respiration. Force is attraction, repulsion, and equilibrium, and there is reason to believe that the essence of matter when discovered will evince a corresponding trinity. The elements of truth in science are the three universal laws; of time, past, present, and future; of space; length, breadth, and thickness the elements of all extension, and so instances might be multiplied to show that all things are reducible to a triune of which neither part can exist without the others, a tripod of which if either leg be removed the whole falls to nonentity. As a result of this law of dependence and a proof of the hypothesis of its universality, all the beings and objects of the universe have a mutual dependence upon each other, so that the annihilation of any element or any species would induce a gradual but sure destruction of the whole.

As in the demonstration of the laws of economy and uniform persistence, even in their application to matter and force, difficulties are experienced in some cases in tracing their operation, so in applying this law we may meet apparent exceptions. In the case of matter it is not always easy to

collect the particles worn away in the processes of nature or art, and by weighing them, prove that nothing is annihilated by being worn out; it is not easy to measure force expended upon the atmosphere to produce vibrations or mechanical motion in it, and show that the effect is equal to the cause, much less to show that the effect of those vibrations so widely distributed equals the force that produced them, but we accept these facts because the law or axiom on which they rest is established by observations within our power. In like manner we have sufficient evidence of a universal law of dependent trinity, to warrant us in accepting this as a known premise in our reasoning, from which we may be able to greatly extend our knowledge to the obscure, and when apparent exceptions occur to induce us to investigate them until we arrive at the truth.

Thus in the case of time and space, we see indications of their being elements of a dependent trinity, and from the inability of our minds to grasp them in all their apparent infinity, we perceive that they cannot be conceived without uniting with them something else. They are dependent for neither can exist without the other. They are together related to, or measures of motion much in the sense in which attraction and repulsion are related to equilibrium, and investigation will show that they are elements of a dependent trinity of which the motion of the heavenly bodies is the third element. We move around the

sun at the rate of more than 1000 miles per minute, and around the earth's axis more than 1000 miles an hour, and can have no conception of a state of absolute rest or its consequences. If our earth's motion was arrested it would produce heat by its conversion to that form of force of such intensity as to convert its entire structure instantly into fiery vapor. Until arrested, it will, with the motion of the other planets and suns, be expended in motion and its consequent time and space, which will be succeeded when the heavenly orbs shall cease to roll by something as different from them as light from darkness, but of which we can form no conception because every act of imagination requires a known resemblance to something familiar. If we were unable to cover our organ of vision, and in a world of constant light from our first consciousness we could not conceive of darkness, but light would seem to us as time and space now do, eternal and infinite. The law of the circle is of interest in this connection.

The law of the immaterial character of all things by themselves, may lead to the final discovery of the essence of matter, and means to act upon it by force to produce or make the various forms of matter including perhaps the metals as we are now able to make what we recognize as compounds from recognized elements, or it may demonstrate the inseperable connection of dependent elements which is most probable.

In the application of these laws to science, constant evidence in illustration of their truth will occur, and in their light it will appear, that, as in the past superstition and mystery have vanished before the light of science, so all things may be found to be in accordance with the laws of nature.

The farther we advance in knowledge the more we are disposed to admit the possibility in accordance with natural laws, of what to the ignorant would seem miraculous. The ancients attributed to supernatural agency the powers of the magnet, the process of digestion, the meteorological phenomena, thunder and lighting, and many similar occurrences which we now know to be natural. They even considered all substances endued with a spirit, a term still used as synonymous with distilled principle. So will future generations recognize much that is superstitious in our present system, and show that all which we consider supernatural is but the operation of natural laws which we have not yet recognized, and that the Author of nature has so perfect a plan for the control of his creation, that any deviation from the course of nature is unnecessary, if not indeed from the relation between his character and the laws governing his works, impossible.

II.

FORMS OF FORCE.

LIGHT—HEAT—ELECTRICITY—CHEMICAL AFFINITY—COHESION—GRAVITATION—CAPILLARY ATTRACTION—CATALYSIS—INERTIA—MOTION—THEIR CORRELLATION AND CONVERTIBILITY.

LIGHT is that form of force which acts upon matter to give it color and that quality which we term visible, or capable of acting upon the mind through the sense of sight. Sunlight possesses the power of affecting both chemical and mechanical action in its actinic rays which attract the stems of plants upward and repel their roots downward. These actinic rays are only found in the light of the sun. As it is applied from above in the thick dark forest or on all sides in the open fields it modifies the contour of the sturdiest trees as well as the tiniest plants. It not only exhibits the color of the objects but also produces their color by its own chemical action. The varied tints of fruits and flowers

and the beautiful hues of field and forest landscape are penciled by the actinic rays of sunlight. It is the force directly active in Photography and until the investigations of M. Daguerre little was known of its properties. The ancients only recognized its influence as a means of vision.

It has recently acquired new interest by reason of certain properties it possesses which render it capable of conveying to us information of far distant objects by means of Spectral Analysis.

When common salt, chloride of sodium, is mixed with alchohol the flame is found to show two bright yellow lines. If through this sodium flame light be passed which gives no lines in its spectrum the yellow lines will appear dark. Different substances exhibit lines of peculiar color and position.

Light is reflected from substances at certain angles. Having been so reflected it is incapable of being reflected at right angles to its first lines of reflection. Light so affected is called paralized light and it remains paralized throughout its entire course be that ever so far distant from its point of examination.

Light affects crystallization of salts and is the source of the controlling agency in all organic functions although only recently recognized as a force. It is capable of direct conversion into chemical affinity and may remain in that form of force until changed to its original form or some

other. Through chemical affinity its correlation with the other forms of force may be readily traced. It also seems capable of direct conversion into heat. Dark colors are soonest heated when exposed to the rays of the sun, light being absorbed and converted to heat.

All light may readily be traced either directly or through chemical affinity or electricity to the sun. There are reasons which might lead us to suppose that light comes to us from the sun in the form of electricity until it reaches our atmosphere. It is still more probable that it returns to the sun in that form.

Sunlight by its effect upon the brain through the eye is capable of inducing a violent congestion of that organ known as sun-stroke. This cannot consistently be attributed to heat, as a higher degree of heat from a furnace fails to produce it. The peculiar affection of the brain which causes the various forms of intermittent fever can be more rationally accounted for from the same cause acting prior to the exhibition of the disease than by attributing it to an imaginary malaria, never proved to exist, and only conceived of, as a necessity to account for effects the true cause of which was not recognized while the action of light was unknown. By passing the light through any yellow substance the actinic rays are decomposed and changed from blue to green thereby becoming inert.

When we remember that hardly any agent of the universe is independent of light and that mankind remained so long ignorant of its influence we are led to look for new and important discoveries of its powers which shall show still further its effects upon mind and matter and its relation to the arts.

HEAT was admitted by Thales to his list of elements. Its *effects* could not entirely escape the notice of even the older philosophers. Until quite recently little has been known of its *nature*. A theory formerly prevailed that this and the other forms of force were invisible fluids. This theory having been disproved by the experiments of Count Rumford in the case of heat is now abandoned with reference to other forces.

Heat is or is like a kind of molecular motion or a shivering activity among the invisible particles or the material element of the heated substance. One of the earliest advances towards the discovery of the law of the compensation of force was by Dr. Brown, of Scotland, the author of the Brunonian theory, according to which all life is heat. A modification of this theory prevailed in this country under the name of Thompsonianism. Although unimportant in its application this theory was as correct as to have said life is light, or electricity, or any other form of force, statements proved to be true by the law of the unity and correlation of forces.

Heat is a form of force whose relations with the other forms have been extensively observed. Its relations with mechanical motion have already been noticed. It is like light essential to all organic action and convertible like it into the vital force of organic life. The sources of heat are chemical affinity, friction, electricity and the sun. Chemical affinity furnishes fire by the union of the oxygen of the air with the combustible substance. By the union of carbon and oxygen producing carbonic acid in our bodies, animal heat is produced precisely like fire in our stoves only with less rapidity, except in the doubtful case of "spontaneous combustion.

All heat can be traced like other forms of force to the sun.

The most conspicuous effect of heat is to overcome the force of cohesion producing expansion. If we take force as attraction repulsion and equilibrium, we may find in light all its qualities, but in heat the force of cohesion seems to be necessary to make its trinity perfect as the power of heat can only be exhibited or converted into motion when it acts upon cohesion to cause expansion as in the case of water converted into steam or the metal reduced from the solid to the liquid form. Here the heat furnishes repulsion and the cohesion to be overcome the attraction.

ELECTRICITY is that form of force which most plainly evinces its relation with other forces. By the voltaic arc it is directly converted into the

most intense heat sufficient to fuse all known substances. Through chemical affinity it is convertible into other forms of force. Passing along a fine wire it fuses it; introduced to water it decomposes it. It is the direct source of magnetism. Being imperfectly known it was until recently presumed to be a visible material substance from the fact that in acting upon matter it exhibits visible effects, but these are now found to be derived from the matter acted upon, the flame exhibiting the same color as from the effect of heat upon the same substances. By means of the aid of electricity to chemical affinity Davy discovered the alkaline metals. Electric ignition shows its conversion into heat. Its sources as at present derived show plainly its correlation with other forms of force. Like light this force is conducted by certain substances more readily than by others, and generally those substances which conduct light most readily are imperfect conductors of electricity, while good electric conductors are opaque.

The force of electricity consists of attraction and repulsion or positive and negative electricity. We cannot produce one without inducing a like amount of the other. Thunder and lightning are the result of the collision of positive and negative currents, and by this union an equilibrium is established in which the electric force is latent only to

be manifested again when the equilibrium is destroyed by the separation of the positive and negative elements which we term the production of electricity.

MAGNETISM is derived from and convertible into electricity. It is only a modification of that form of force. We cannot produce either of these forms of force without producing the other. It is also capable of direct change into heat. It deflects polarized light. Chemical affinity and crystallization are affected by it. It acts most readily upon substances which are good conductors of electricity. Our bodies and nervous system are also influenced by it. Nervous invalids lie most comfortably with the head towards the north bringing the direction of the nervous current in line with the course of terrestrial magnetism. The mineral cyanite arranges itself in crystals corresponding so exactly to the poles of the earth that it may be used as a substitute for the magnetic needle. Like electricity it is attraction, repulsion and equilibrium. It affects all substances in greater or less degree.

THE ATTRACTION OF COHESION acts upon the element of matter to give it form or render it material. In different degrees it produces the solid liquid and æriform conditions of matter. It has been supposed to be identical with gravitation and magnetism. It is the same force that produces crystallization. It is directly allied to heat and convertible by the influence of that force into its own form and thence to other modes of action.

CHEMICAL AFFINITY is a modification of cohesive attraction which acts to unite substances into compounds differing very widely from the simple mixture of the ingredients. A striking peculiarity of chemical affinity is that it can only act between definite quantities of substances or exact multiples of those quantities. The same law of multiples applies to the angles of crystallization and is in conformity with the sentiment of Pythagoras that "Number is the basis of all things." Taking as a standard hydrogen, whose combining equivalent is lower than any other substance, a table is formed giving the number of parts of the other substances which combine with one of hydrogen and these numbers are termed their chemical equivalents. Light and heat are the sources of chemical affinity and it produces those forms of force in combustion, or in slower action as in the slacking of lime. It is also the direct source of electricity with which it evinces plainly compensative mutual convertibility. In the decomposition of water chemical affinity disappears and electricity is manifested. In treating of vital force it will be seen that chemical affinity directly produces that form of active power. It also produces magnetism when the lines of combination are in definite direction. Its action produces motion in the substances which unite. It is influenced by electricity and like light is a form of that force in the state of equilibrium and if the equilibrium is destroyed chemical affinity appears as positive and negative

electricity by decomposition analagous to that by which oxygen and hydrogen are derived from water.

CATALYSIS is an agent for rendering chemical affinity active. The force so developed may be converted to the other forces by first changing it to a voltaic form.

CAPILLARY ATTRACTION *endosmosis* and *absorption* are but modes of action of other forms of force.

GRAVITATION is that which gives to matter the quality of uniting into immense masses by reason of a tendency in all bodies to approach other bodies in proportion to the amount of matter they contain. It is cohesion on a mammoth scale and acting at unlimited distances with a force inversely proportional to the square of the distance. By reason of the consciousness of effort to overcome its action it gives to bodies on our earth the quality of affecting our minds in an impression which we call weight which is the measure of the earth's attraction upon terrestial objects. It is the force which produces the motions and regulates the positions of the systems of suns planets and worlds as well as of comets and meteors. It is convertible into the other forms of force through the motion which it induces.

The only exception that appears to exist to the law of exact quantitative economy of force, is in the law of gravitation by which it acts upon substances with a power proportioned to the square

of the distance. To make it in conformity to the great universal law of economy we must discover some effect produced by it as it passes through space in proportion to the loss or decrease of its force. The only means of accounting for this loss so far as I can conceive is to trace its relation or conversion into space as intimated in the first chapter of this work or to consider that like light its rays diverge as they proceed from their source.

INERTIA is the conservation of force in the form of motion until by the arrest of that motion it is restored to the world in some other form.

MECHANICAL MOTION or the *movement* of bodies is in many respects so different from other forms of force as to occasion a little difficulty in conceiving its identity with them, but observation shows that force may exist in that form, being expended to produce it, and reappearing upon its arrest. Its quantitative relation to heat has been given. The eternal persistence of force is seen in the impossibility of arresting motion save by means that produce other motion, or other forms of force. The element of force in its various forms is so strictly immaterial in its nature that the best conception of it of which we are capable is that it is like motion, as all our conceptions of unfamiliar things involve the necessity of likening them to things better known.

The peculiarity of the action of chemical affinity between multiples of the lowest combining equivalent has raised a hypothesis that matter is

composed of minute atoms or molecules and it has been assumed that the forces light heat and electricity act upon these atoms by producing a shivering motion in them and that chemical affinity cohesion and similar forces are attraction between these atoms. The atomic theory does not necessarily conflict with the doctrines of the dependent trinity and economy of mind matter and force, but it is a pure hypothesis, and it seems likely that with a better understanding of the triune nature of the principle of matter we may attain correct views of the reciprocal relations between matter and force which shall enable us to account for the operation of the law of multiples in chemical affinity, and crystalline angles from the same cause, and independent of the atomic theory. The phenomena of isomeric substances can be more reasonably explained by assuming that the element of matter is differently affected by force than by assuming a different arrangement of atoms which so far as we know could not produce the effects which distinguish diamond from charcoal or starch from sugar, and which, if present, must be the effect of a change in the forces acting upon those substances.

The preceding remarks upon some forms of force show the correlation of the Physical Forces a law of the greatest importance to science and to art. It is generally accepted by modern philosophers. The next chapter will be devoted to vital force.

III.

VITAL FORCE.

ANIMAL AND VEGETABLE ORGANIC LIFE—ANIMAL LIFE—ORIGIN—CORRELATION—ESSENTIAL CONDITIONS.

"Know thyself" was written over the portals of the temples of Greece as the most appropriate decoration of those magnificent structures of ancient art. "All our knowledge is ourselves to know;" the highest application of all knowledge is to derive from it the laws of our own mental physical and moral being. Every individual of our race whether rich or poor high or low, may justly express and endorse that noble sentiment "I am a man, and whatever pertains to mankind interests me." If it is true in a social sense that "one-half the world do not know how the other half live," it is doubly true in a more literal sense that the greater part of the people in the world have not the slightest conception of how their own individual existence is continued. In view of the great value

placed upon human life and its universal possession by all classes it is remarkable that this subject has received so little attention from the human race and it illustrates the advance in science in accordance with the law of progress by which subjects are investigated in a certain natural order of succession, from the plain and material to the more obscure and spiritual, without any reference to the importance of the different branches. The natural sciences are justly favorites with the highest order of philosophers. From the storehouse of nature are drawn many examples of the wisdom and benevolence of its author, many awful revelations of the grandeur and majesty of his handiwork of the highest interest to his creatures. Thus astronomers and geologists unveil to our view a bright immensity of lights on high, which from incomprehensible distances shed through space a spark that marks to our finite sight their being, and our earth a single individual of the mighty train, forever walking in her appointed path with iron frame and heart of fire, bearing in her hand storms and thunders, with seas for her attire and floating clouds gemmed with meteoric lights and flashing lightnings for her veil. From the countless worlds which move majestically through the realms of space, to the tiniest dewdrop that sparkles in the sun, nothing can be found in nature more interesting curious and important than that form of force which we call *life;* the source of the highest beauty of nature and an essential characteristic of

the crowning excellence of creation, man, in the image of his Maker and endued with the breath of the Eternal.

Man is an epitome of the universe and in more than one sense "Self-knowledge is all knowledge," as fully to comprehend our being, necessitates an understanding of the whole realm of creation. Nature like man is an image of Deity and natural laws apply to our existence.

Those who have devoted their lives to the study of vital phenomena find that every discovery opens to view a new vista of unexplored possibilities beyond, while the hundreds of false theories that have prevailed in the past lead us to advance cautiously in this field and question every doubtful hypothesis closely before venturing to accept it as established truth. Until a comparatively recent date the arteries as their name still indicates were supposed to conduct air because empty after death. We may form some conception of the theories of vitality in the successive eras of the past, from the fact that nearly every organ, and part of the body has in its turn been considered "The seat of the soul." The heart, lungs, liver, spleen, pancreas, diaphragm, blood, pineal gland, &c., have each been accepted and rejected as the source of life, until now we are able to trace vital manifestations to the brain, and demonstrate that every other organ of the economy is but subservient to the conditions necessary for its action.

The brain, is the center of the nervous system consisting of nerves of general and special sense motion and organic life. It is securely enclosed in the cranium and sends nerves through the spinal cord to every part of the system. It also sends off twelve pairs through the openings of the cranium called cranial nerves and these include the nerves of the four special senses.* It consists of two hemispheres exact counterparts of each other and each hemisphere presents two principal lobes called the cerebrum and cerebellum, the former occupying the superior and the latter the inferior portions of the cranial cavity. In man the cerebrum is much larger than the cerebellum. The medulla oblongata connects the brain with the spinal cord and in it the fibres from the brain cross to the opposite side. The brain substance consists of certain salts principally phosphates dissolved in water with fat and albumen. It presents an external gray cellular substance, protected from contact with the cranium by the meninges or membranes of the brain, and an internal fibrous structure. These structures are analagous to the bark and wood of trees. In the spinal cord the grey cellular substance is internal. The Great Sympathetic system of nerves

* The names of the cranial nerves are: 1st. Pair Olfactory. 2d. Optic. 3rd. Motores Occulorem. 4th. Patheticus. 5th. Trifacial. 6th. Abducens. 7th. Facial. 8th. Auditory. 9th. Glossopharyngeal. 10th. Par vagum. 11th. Spinal accessory. 12th. Hypoglossal.

The names of the cranial nerves and their order by numbers by which they are often designated may be conveniently remembered by the correspondence of the first letters of their names to the first letters of the words in the following couplet:

" On old Monadnocks perennial tops,
A Finn and German picked some hops."

or the nerves of organic life have several centres called ganglia (knots) upon the organs of digestion respiration &c. and branches are distributed from these to parts which act independently of the will. The structure of the great sympathetic resembles the grey matter of the spinal cord and is intimately connected with it. Both the anatomical arrangement, and observation of disease and injury, as well as experiment upon the lower animals shows that the white substance of the brain supplies the force necessary for the operation of the nerves of motion and sensation which are distributed from it to every part of the body, and that the grey substance is the seat of the intellect; while the great sympathetic system controls the involuntary functions. Such are essentially the elements of the nervous system in all animals with modifications to adapt it to the various degrees of intelligence and activity in different species. In all species the great sympathetic is present being essential to organic animal life.

Life, says Bichat, "is the aggregate of the forces which resist death." Death is the cessation of the vital function, which permits the living structure which has withstood, through the protection of the vital forces the chemical tendency always existing to decay, to gain the mastery over the structure and decompose it into its elements. It is dissolution. A peculiarity of the vital force, which serves to distinguish it from every other kind of force, is shown in the faculty or power

possessed by all classes of living things to reproduce other structures, exact counterparts of the parent in all important particulars and often in the higher classes of animal life exact models of the original, and themselves capable of propagating other offspring and thus continuing the species indefinitely. Organic life is that which originates and developes organic bodies, controlling their growth and repair. It is common to both animals and vegetables. The science which treats of the functions of animal bodies in health is named Physiology, of Vegetable Life, Vegetable Physiology or Botany.

Organic life is aided by the forces of light, heat, chemical affinity, etc., to such an extent that it sometimes appears to be little more than the operation of those forces, yet if it is destroyed we see the structure of the plant or animal left to the control of those forces alone, immediately commencing to disorganize its structure and ceasing growth and repair. Hence every organic body represents in itself while living not only the matter which it possesses in common with dead organic remains, and the chemical forces which have acted in building it up, but also a certain vital principle which, while it has not done the whole work of building up the body and repairing its constantly occurring disintegrations, has yet organized and controlled the forces at work as the general arranges and controls his troops for action, without himself personally accomplishing the object

to be attained by his own working or fighting power. As to the origin of this peculiar force that superintends organic functions, it has been supposed that the germ contains a hidden, dormant principle of life, received from the parent, that developes into the force necessary for the future organic functions. It seems more probable that the seed only contains the peculiar principle that decides what is to be the type or kind of the future plant or animal, and that for the common principle of organic life possessed by all living things we are to look to those conditions that we see necessary to the growth and vitality of every species. Thus we may have a perfect seed and all the elements necessary to the construction of a perfect plant, but without the combined effects of moisture and the light and heat of the sun there will be no organic development. We must then consider the source of the force of vegetable life to be the light and heat of the sun, and the soluble elements for chemical affinity of a kind to produce the necessary structure, together with the seed to supply the primary controlling influence and decide the character and type of the growth.

The seed of the plant is the result of the contact of the pollen with the ovary of the flowers. In some species the male and female organs are on the same stock or even in the same flower, but frequently they are on separate plants and dependent upon chance for their union. In the corn the pollen is upon the tassel while it must come

in contact with the ovary by traversing the very minute tube leading through the center of each silk of the corn to produce each kernel. Here we have what appears to be a mutual attraction acting to produce the necessary union, and in the seed this attraction is replaced by a force which gives to the seed its very wonderful properties which we describe as its polarity, or quality of possessing poles, whereof one is positive, and the other negative, with reference to sunlight, which causes the stem to grow upward, and the root to grow downwards, a vital effect of no little importance to the plant.

In advancing from the organic life of the plant to that of the animal, we find that while animal bodies grow and develope in much the same manner as plants, we have here a greater variety of elements for the action of chemical affinity by reason of the greater facilities for obtaining and selecting nutriment; a more perfect digestive respiratory and circulatory system, in most cases a more uniform temperature, by means of the heat-producing powers of the animal, and above all a more perfect and efficient controlling vital principle in the force of the nervous system of organic animal life, so that, while in the most favorable climates of the tropics we find vegetable life far more perfect and luxuriant than in the polar regions, in consequence of more light and heat from the sun, we have in the products of animal growth a class of compounds and structures

infinitely more complicated and perfect than can be found in the inanimate world, which would entitle it to the rank of a higher branch of the creation, independently of its connection with the higher powers of animal life. As the vital functions are ever acting by reducing living tissues to dead effete matter which is eliminated from the system, the seemingly anomalous definition of life that it is constant death is correct, although we make a distinction between the disintegration of tissues, while their place is immediately replaced by the new elements taken from external sources and the cessation of growth and repair allowing the whole organism to decompose.

The most important use of the vegetable kingdom is its subserviency to the support of the animal kingdom. The plant sends down its root into the earth and spreads out its leaves in the air to take the crude forms of matter and fit them for the use of the more complicated machinery of the animal organism. As the animal fabric is dependent upon the vegetable world for its support, it is also the means of itself maintaining and developing a higher form of force.

Leaving organic life and advancing to the consideration of animal life, we observe that while animal bodies are only more perfect plants than are found in the vegetable kingdom, when considered simply with reference to their origin, and development; yet, *animals* are distinguished from plants by a principle entirely distinct from

anything exhibited outside of the animal kingdom by which they are enabled to feel and move.

Animal life consists of two distinct properties, *Irritability* and *Excitement*.

Irritability, the "tonic power" of Stahl, is that property of muscular power which enables it to respond to the action of certain stimuli. Muscular tissue consists of bundles of fibres arranged so as by their contraction, or shortening, they effect the motions of which the body is capable. Muscles are divided into two general classes; first, those of organic life, as in the heart and in the digestive system, or the muscles of respiration. These are also called muscles of involuntary motion. Secondly, those of animal life, comprising those muscles subservient to the will known as muscles of voluntary motion. In some instances muscles receive nerves of each kind and are termed mixed, as in respiration, which we may partially control by the will.

The ability to contract under the influence of the nervous stimulus is itself a vital property, and is as necessary to motion as the stimulus itself. The muscular system derives this force from disintegration in the muscles of nitrogenous compounds derived from the blood. It remains for a few hours after death, and is followed by a state of tonic contraction of every muscle in the system, known as *rigor mortis*. This is always in proportion to the strength of the muscular system at

the time of death, those who die from lingering, debilitating diseases exhibiting least of it.

The blood receives from the digestive system the principles from the vegetable world, either directly or after they have been first submitted to the action of the digestive process of other animals and converted into animal tissue. All animal nourishment comes from the vegetable kingdom if we except those elements derived from the air and water. If the vegetable substances are too crude for our digestion we get the lower animals to help us digest them, but we trace all food to a vegetable origin. Now we have seen that the plant consists of the elements necessary to form its structure, together with the chemical affinity necessary to unite those elements into their several compounds and the vital principle of organic life. The elements received into the stomach, together with the forces acting upon them, either continue in the same compounds or else unite into other compounds and enter the blood in the form of Proximate Principles, which are compounds in the state in which they exist in the animal tissues, such as albumen, starch, fat, phosphate of lime, etc. It is easy to see that the fat by union with the oxygen of the blood having its affinity destroyed is the direct source of another force in its place in the form of heat. Now by the disintegration of the muscular fibre another form of force is the result which we recognize as rritability, a force first developed so far as we can

trace it in the plant, as the result of the light and heat of the sun. Dr. Brown Sequard proved that the irritability of muscular fibre is a vital principle dependent upon oxygen in the blood, by observing that in a decapitated man, nine hours after death, this property of the muscle being lost it immediately returned upon injecting fresh arterial blood into the body, and contraction again followed the application of the galvanic current.

This property of contractility is a form of force by which the muscular tissue is enabled to contract upon the application of certain stimuli. The stimulus of the galvanic or electric current will produce this result. Galvanism is the result of chemical affinity, and is generated by the action of an acid upon the metals, copper and zinc, in the common battery, and although capable of contracting muscular fibre is not the agent employed in the living economy.

We have found the brain composed of certain substances, conspicuous among which we observed the phosphates, while the other substances composing it served the purpose of preserving these in a suitable form to be acted upon gradually by the action of the blood. We also find that while the human brain constitutes but one-fortieth part by weight of the entire system it receives one-sixth of all the blood, or more than six times its average share, showing the great relative importance of its functions. We also observe that it sends branches principally through the spinal

cord to every part of the system, and that when certain of those branches which we recognize as nerves of motion are divided all powers of moving is removed from the parts beyond the point of division to which these nerves are distributed, and that disease or injury of the brain may produce the same effect. These facts are quite sufficient to demonstrate that the exciting cause of motion in the voluntary muscles is an influence or force generated in the brain, and conducted by the nervous filaments. Further observation in disease, as well as the anatomical arrangement of the parts concerned, demonstrates that the white, fibrous structure of the interior of the brain produces this form of force.

It is also found that the vital processes that take place in the brain during the performance of this function consist in the breaking up of affinity or disintegration of the phosphates of its structure and that the phosphates after being so acted upon by the oxygen of the blood are eliminated by the excretory system in the form of simple binary compounds. There is a marked analogy between this process and that which takes place in the battery for the production of the galvanic influence. It is not, however, more rational to suppose this influence identical with that of the battery than to assume the same with regard to animal heat, or the irritability of muscle, for the process of the production of those forms of force is equally similar to it. It is not originated or conducted by the

same means as the galvanic current, which passes metalic substances freely, while by taking hold of a wire we are hardly able to communicate to it the nervous power. These distinctions would be sufficient to entitle it to recognition as a distinct form of force, but there is another more important distinction; the nervous influence is capable of certain reactions with the mental quality of the individual through the will, a subject that will be again referred to in its appropriate place. Like the other forms of force this may be directly traced through the elements and compounds of nutrition to the light and heat of the sun acting in the plant, and like animal heat and irritability it is the result of a process excited by the action of the oxygen received in respiration. The vital force was dormant in the form of chemical affinity until that was broken up by the union of oxygen, just as the explosion is latent in the gunpowder until by union with oxygen it is developed.

The exciting force or stimulus of the nerves of organic life or involuntary motion, is distinct from that of voluntary motion. This is a property residing in the system of ganglia, known as the great sympathetic nerve having its center in the gray matter of the interior of the spinal cord where a store of this force is in reserve to keep up the action of this system during temporary emergency. In certain cases, as of asphyxia or fainting (syncope), when the functions of animal life are suspended from a deficiency of the supply of oxygen

or other cause, those of organic life, breathing, animal heat, pulsation of the heart, etc., are capable of supporting a feeble action for a considerable time in consequence of this reserve of force. Stimulants exhaust this reserve force, and hence reduce the powers of vitality. The influence from the great sympathetic nerves does not appear to be so distinct and independent a force as the nervous influence from the brain to the nerves of voluntary motion. It rather has the property of modifying the irritability of the muscular fibres of organic life so as to cause them to respond to common irritation or the contact of any irritating substance. Thus the contact of the food with the coats of the stomach excites the activity of that organ in digestion, and produces the abundant secretion of the gastric juice observed after a repast. The contact of the blood with the muscular cavities of the heart excites that organ to a contraction; the presence of any irritating substance in the respiratory or nasal passages, or digestive canal, produces an excessive secretion; heat excites perspiration, thus enabling the system to maintain an equal temperature. In every case in which the involuntary or organic system is active there appears some exciting cause, of which the nerves of the great sympathetic are only the guiding agency like the principle of organic life in the plant, guiding and directing the forces that under its influence perform the work of the organic functions. If the vital functions of growth and repair

were under the control of the will, sleep or forgetfulness would result in death. All animals have the system of organic life and are capable of reflex motion, while in some of the lower types of animate nature it is impossible to recognize any other form of force. They appear to be as destitute of conscious voluntary life as the human stomach. Recent histological observations seem to demonstrate a further source of animal and organic force from the direct disappearance of heat, that force by virtue of its correlation with the vital force disappearing, and by its disappearance eliminating an equivalent amount of nervous power. Liebig affirms that while there is not a uniform relation between the urea, the product of the disintegration of muscular tissue, and the amount of muscular action performed, by extending the comparison to the carbonic acid exhaled as the measure of the animal heat produced, and taking this as the expression of an amount of force which, by a knowledge of its quantitative relation to mechanical motion we are able to estimate, the muscular force is accounted for and the law of the compensation of forces is demonstrated.

It appears also that the muscles of organic life are the principal recipients of this force, and it may be inferred that the nerves of this system exercise some influence in effecting the change of heat to working power. In the disintegrating process of germination and growth in plants a similar elimination of carbonic acid takes place, as

a result of the production of an amount of heat which is very sensibly observed in the sprouting of barley in the manufacture of malt. This heat in the ordinary growth of the seed is, as Dr. Carpenter observes, probably a source of a portion of the organizing force of the plant.

THE ESSENTIAL CONDITIONS for the operation of animal life are supplied by the digestive, circulatory and respiratory functions, which form a system that furnishes a striking illustration of the law of dependent trinity. The digestive system receives the substances necessary for the growth and repair of the structures of the body, and converts them into blood; the respiratory system supplies the blood with oxygen, by reason of the affinity of oxygen for iron, one of the elements of the blood; and the circulatory system carries the blood where it is needed, and by making it a vehicle for the conveyance of oxygen from the lungs and of carbonic acid from the system preserves the purity and vitality of the economy.

In all species, of both animal and vegetable structures, these essential functions exist with various modifications to adapt them to the several species. In fishes the oxygen is received from the water passing in contact with the highly vascular surface of the brachia, but no animal lives without a due supply of oxygen. The various degrees of vital force, as well as of mental power existing in different individuals of the same species, in different species, and even in the same

individuals at different times, prove a direct relation not only between the nervous system and its activities, but exhibit the complete correspondence between the essential conditions for the operation of the forces of animal life and their manifestations. The practical deduction from this is, that by the preservation of the functions of digestion respiration and circulation with their auxiliaries of secretion, absorption, elimination, assimilation, etc., in a state of normal activity, and by a due supply of fresh air and proper food, we may increase in our systems or in animals the quantity of vital force, not by actual creation, but at the expense of the great fountains of strength from which we are permitted to draw, the physical structures and forces of nature. We may thus attain to that desirable desideratum, a sound mind in a sound body. "*Mens sana in sana corpora.*"

Further observation of the forces of life shows that in their various forms of action they are mutually correlated and convertible. Excessive mental application by directing the vital current to the production of ideas, draws from the supply that would otherwise be used by those functions and weakens muscular power and the digestive system. Excessive muscular exertion produces less perfect activity of the mind; severe pain, by expending the vital force in sensation, often induces fainting and always prostrates the powers of the system, and in general the activity of any function beyond the natural limits consistent with

the equilibrium of the system detracts from the force of other functions. This correlative convertibility applies further to the manifestations of the mind in different forms, as memory, passion and reason.

Having now examined the doctrines of the correlation of the forces you are prepared to step into a buggy and take a drive, and know that the motion of the vehicle expended in the heat of friction upon the earth and the axles, and in mechanical motion of the atmosphere or sound, is the direct result of the vital force of the horse, derived by conversion from the chemical affinity and organic force or life of the straw and provender on which the beast was fed, and that the primary source of these was light and heat of the sun; or, if more convenient to take the steam cars, you can trace their motion through fuel, either of recent or remote growth, to the same source, and you may trace all motion and force to the same origin. After you ride we will proceed to the interesting subject of the mental and moral forces of the Universe, the image of the—

"Eternal one, whose presence bright
All space doth occupy; all motion guide."

IV.

MENTAL FORCE.

MIND—QUALITIES—LAWS—CORRELATION—CONSERVATION —PSYCHOLOGY AND MESMERISM—LOWER ANIMALS AND MAN—DEPENDENCE.

As the mineral kingdom and physical forces in nature develope the vegetable and that supports the animal kingdom, so irritability and excitement or animal life furnishes the conditions which eliminate a higher form of force called mind, attended with consciousness and sentimentality. Mind is in itself independent of time or space, and reaches to the utmost limit of the universe as quickly as to less remote regions, although the organs for its exercise require more or less time to act. Mind furnishes the source of that power which has been felt through all the ages of the past, which controls the world's ever changing succession of wars, enterprises, and revolutions in the present, and is destined to have sovereign control through all eternity. It furnishes the means for the development of the

immortal soul, the highest created existence, and is one element of that triune being. It is directly correlated to the physical forces and accomplishes the office of a force in the highest sense of the word. It has been observed to be the controlling agent of the voluntary motions of animal life.

There is good reason to believe that, like matter and physical force, mind is in itself a definite unity and that all its manifestations are but the varied exhibitions of this force, differently manifested as a result of different relations, from circumstances capable of affecting the manner or form of its manifestations.

The activity of the organs by which it manifests its *operations* are distinctly traced to the same source as those of other forms of force in nature, namely, the sun.

We have traced the exciting cause of the voluntary muscular contraction to a force eliminated in the white fibrous structure of the brain as the result of disintegration of the phosphates. Now the gray cellular substance of the external part of the brain is also rich in these salts, and observation shows that study and mental activity decompose them even more than physical exertion those of the white fibrous structure. The secretions eliminated by the clergyman on Monday, or by the lawyer after an earnest and elaborate plea, are evidences of this fact. Every thought eliminated by the brain is the effect of a physical change in its gray substance precisely analagous

to the change in the white structure by which the vital nervous force is set free. Every feeling and emotion is attended with the same consequence, and the character of the manifestation depends upon the organ or portion of the brain that is acted upon by the mind. As every action of the brain leaves a mark or scar upon its substance, it has been supposed that these account for the fact that nothing is ever forgotten during life, but every thought or emotion may be recalled by a train of circumstances capable of directing the mind in the same channel.

As the exterior of the cranium only gives a general and indefinite outline of the structure of the brain, Phrenology can never become an exact science, but is principally of interest in so far as it confines itself to the field of mental philosophy. As it is observed that any lesion of that portion of the nervous system known as the nerves of voluntary motion destroys the power of motion, so it is found that any affection of the mento-cerebral apparatus affects the manifestation of the mind, and slight compression of the brain, or an insufficient supply of arterial blood (oxygen), will completely arrest it.

The intimate relations between the mind and the body are of intense interest to every scientific mind, and there has been no little difficulty in tracing this connection and discovering the precise point at which the mysterious link that unites the two is to be found.

The influence is reciprocal, and in considering the subjects of mesmerism and psychology I shall show how mind acts upon matter, in the body and elsewhere, while here I will explain the converse action of matter upon mind. It has already been demonstrated that we cannot conceive mind to exist without something about which to think or independently of matter and force. Now, in describing the nervous system of man, it will be remembered that reference was made to nerves of sensation, general and special.

The senses are feeling, smelling, tasting, seeing and hearing. The nerves of the sense of feeling accompany those of voluntary motion to the spinal cord, where they are given off in the same manner as the former, and by a similar arrangement are distributed to every part of the system, but more densely upon the surface, and, in highly sensitive surfaces, than elsewhere. These nerves plainly convey to the brain and through that to the mind impressions of the form, density, size, temperature etc., of qualities of objects brought in direct contact, but except by material connection can produce no impression.

Here the impression seems to be an effect produced by the operation of the forces of the object transmitted to the mind, but if any change takes place in the object, as a result of this impression, it has not yet been discovered. That the impression is conveyed by these nerves is plain, as in the other cases of motion and special sense, from

the fact that any lesion of these nerves serves to directly and entirely destroy the function assigned to them. The senses of tasting and smelling are only modifications of the sense of feeling; a modification dependent to a great extent upon the character of the sensitive surfaces of the tongue and Schniderian membrane. These senses act so much in common that if smell is impaired we are able only very imperfectly to decide delicate flavors by taste alone. The sensation from any acrid or pungent substance upon the tongue or nasal membrane clearly resembles the impression produced from its contact with a highly sensitive surface, as when the cuticle is removed. The sense of sight is entirely distinct from the former three. It is able to receive impressions of objects at a distance and convey acknowledge of their color, form, etc., which impressions are not perceptible to any other sense. The anatomy of the eye leads us to consider this impression the result of the contact of the rays of light proceeding from the object to the retina. I am inclined to suspect this is only a part of the process, and that there is some as yet undiscovered influence originated in the brain that is sent from the eye to the object, from an apparent or real consciousness of such an action taking place.

Like sight, hearing takes cognizance of impressions unobserved in ordinary intensity by the other senses. These are the impressions of sound or mechanical vibrations of the atmosphere. By

the agency of these five senses the mind receives the impressions which bring it into relation with external objects, and are the food from which it derives the elements that it converts into the passions, reason, imagination, hope, fear and in short all the mental attributes. We can trace the various steps of change in the mind by which these sensations are able to produce all the varied effects with almost as much exactness as we can trace effect and results in the physical world. The mind is affected directly by matter and force. The further affection of mental manifestations by material and physical agencies is shown in the fact that its operations are always in direct proportion to the conditions of the brain itself, a material organ, and the requisites for the action of the physical forces which produce mental action. Education advances mentality by improving its machinery.

To investigate and understand our powers of mind and the methods of exercising them, are duties to which science assists us, and interest impels us. We observe a close relation between the mind and the functions of organic life. A few illustrations will show that this influence is of no little importance, and establish a correlative influence compensating for that received from the material world upon the mind. The functions of animal life are under the direct control of the will. The action of the mind upon the involuntary organic functions is seen in the excitement of the heart in consequence of any violent emotion, the

hurried breathing under the influence of strong passions, the flow of the tears in grief, or excessive joy, or mirthfulness, the activity of the digestive organs in contentment and cheerfulness, and their torpor in melancholy or grief. The perspiration of the axilla immediately acquires a peculiar offensive odor in consequence of the emotion of bashfulness; melancholy produces an offensive odor of the feet; insanity has its characteristic odor; violent emotions, as of anger in the mother, vitiate the secretion of milk so as to produce cramps, convulsions and even death of the nursing infant. Cheerfulness and contentment exhibit their happy effects in blooming health, while remorse, anxiety and despair mark their victims with haggard aspect and emaciated frame, and finally consign them to the grave. Home-sickness has in some cases had the same effect. Violent grief by inducing an acid secretion of the hair follicles, has been known to blanch the raven locks of youth in a single night to the silvery whiteness of old age.

Directing the attention to almost any organ or part of the body will induce there an unpleasant sensation. Those who have made a special study of any part of the system have often died from disease of that part, as in the case of Harvey, who discovered the circulation of the blood and died from disease of the heart. Persons who are but little occupied, leading luxurious and indolent lives, feel many infirmities from which they

escape upon being driven by necessity to a more active life.

These and many other similar phenomena are readily accounted for by a careful consideration of the facts already stated, and an application of the general laws of compensation and unity of which these are examples. This action of the mind upon organic and material structures, taken in connection with the action of matter and physical force upon mind, is the mysterious link that connects the mind with the body, and makes plain the nature of that numerous class of affections of so much interest to all who attend to disease, which are classed as hysterical and nervous affections, wherein through loss of control by the *will* over the distribution of the mental and vital force its manifestations are of an abnormal and often alarming character.

Pursuing the subject of will and mental influence, we observe that it is not confined to the individual alone. Certain involuntary organic actions are capable of being excited in susceptible temperaments by witnessing them in others. Hysteria and fainting are often observed to be communicated in this way. Yawning is also induced by the same means, but for this effect it is necessary that the persons shall be *friends*, who are interested in and fond of each other. This influence, which might be considered very trifling in itself, leads to a subject of great interest and importance in the various manifestations of charming,

will–power, mesmerism, psychology, electro-psychology and kindred influences so very remarkable as to constitute an appropriate branch of science by themselves. It has long been observed that animals possess the power of charming in certain cases, as that of the fox or the serpent charming the bird, and probably the cat, the hawk and many other animals have this power over certain other animals; it has also been admitted that man has the power of controlling fierce animals by the power of the will acting through the eye, but until the discoveries of M. Mesmer little that was definite or exact was known, by modern philosophers in civilized countries, of the power of charming possessed by man over those of his own kind. This gentleman accidentally discovered, while soothing his child, that he had induced a remarkable and interesting state, in which the child was under his control independently of any manifestation of his will by the usual mode of communication, and as he had, while inducing this effect, stroked the child's head downwards, he very logically concluded that stroking it upwards would destroy the effect, a means that in accordance with his wishes was quite successful. M. Mesmer afterwards induced this state in many others, and gave his name to that form of charming known as mesmerism. It is probable from the accounts that reach us of the performances of the Oriental jugglers and magicians that this science has been even more fully developed among them than

among more civilized nations, and that they are in the habit of employing it upon both men and animals, particularly serpents. When we consider that in its various forms this power is ever active in society; that the charms of music and oratory are but exhibitions of it; that it is closely connected with the social and family relations, and that it is a power given us by our Creator to use wisely, and capable of extending our powers for good or evil, we may well esteem it a proper field for scientific investigation.

Laying aside the consideration of those familiar and common effects of will-power exhibited in the government of the family, the school, the army and the state, as well as the influence of the will over the voluntary acts of the individual let us first observe the most perfect operation of the the will-power yet attained, as exercised under the names of Psychology or Electro-Psychology and Mesmerism.

The process of inducing this state is not necessarily uniform by different operators. As this power is universally possessed by mankind in various degrees, and as I know of no other source for obtaining information in regard to its practice, I will give here the method employed by many expert Psychologists, and which may be employed by those disposed to test their powers in this direction, observing carefully the cautions given which, I think, are sufficient to guard against any unfavorable effects.

In selecting a subject be sure there is no tendency to hysteria or other affection likely to prove alarming upon nervous excitement. If the subject has been previously operated upon the state can be induced infinitely easier than if it is for the first time. It is also observed that next to those who have previously been in this state those who have been in the similar state of somnambulism, and particularly those much addicted to walking in their sleep, are most easily affected. Having decided these questions favorably the first step is to be sure the subject is entirely willing to be influenced—not barely willing to have the attempt made, but willing to be *put to sleep;* for unless the wills of the two persons act in unison it will not be easy for the operator to succeed, if not, indeed, quite impossible. This point being decided, let the operator seat himself opposite the subject and take lightly hold of his hands, with the fingers resting in the palms of the subject's hands and the balls of the thumbs pressed against those of the subject. Let the two persons look each other directly in the eyes; the eyes are brought within two feet of each other. Let the operator, by an effort of the will, excite and direct to the subject the nervous influence, and exercise a determination to succeed in inducing the psychological state while the subject remains passive and indifferent. Let nothing occur to distract the attention. As soon as the operator observes any difficulty in holding the gaze direct by a tendency

to rolling of the eyes, let him pass the hands, simultaneously or in quick succession, to the forearm, with the fingers on the ulnar or little finger side, then to the arm below the shoulder, with the fingers pressing upon the nerves upon the inside of the arm in this region, then to the collar-bone, then in quick succession to the third cervical vertebra at the back of the neck and over the head without removing them until the palms of the hands rest upon the top of the head, then bring the balls of the thumbs over the subject's eyes, which have been held with a fixed gaze at those of the operator until this time, and, bidding the subject close the eyes, press gently with the balls of the thumbs upon the closed eyelids, while the fingers rest upon the top of the head. Take the bridge of the nose between the thumb and forefinger of the left hand, with the right hand pressing firmly against the occiput for a moment, then make a few passes downwards, near the temples, and bring the hands up in curved lines further from the subject than they were passed downwards, or stroke the temples downwards and carry the hands upwards at a little distance from them; with the right hand lightly touching the subject's left temple say, with will, "*You cannot open* your eyes; open them if you can; or close your eyes *firmly* and you *can't* open them," and the first and most difficult steps are attained in getting control of the voluntary movements of the subject's body. As soon as the subject discovers

that he cannot open the eyes strike the hands together before his face and say, "All right!" and he will probably open them, but if this fails ask him if he will not open them, and, after getting his consent to do so, repeat the "all right," if necessary, and he will respond to the wish of the operator and open them. He is now in a state to follow the wishes or will of the operator. Let the operator look him steadily in the eye and lay his hand under the subject's and say, you can't remove it. It will be true. Then say you cannot get up from your chair, and it will be impossible for him to arise. After a few experiments the operator will be able to control his subject even when behind him, out of sight, and without the knowledge of the subject compel him to raise his arm, to keep it raised or perform other acts in compliance with the will of the operator. It is unnecessary to illustrate further the control over voluntary muscular motion, only adding that it is complete. I will mention some examples to show the control also over the mental activities. Having now obtained control over the voluntary movements let the operator look the subject again steadily in the eye and tell him his coat is on fire, and he will see the coat burn as distinctly, at least, as in a dream, and attempt to extinguish it. He may be freed from this delusion and restored to the normal, ordinary use of his senses by the same means as are employed to restore him to the usual control of his muscular movements in the

other experiments, namely, by the operator clapping his hands and saying, "All right." In the same manner he may be caused to believe the house on fire, himself surrounded by wasps, or to see houses, fields, parks, groves, lakes, or other objects described to him by the operator. Causing the subject to catch fish from an imaginary pond, with an imaginary hook and line, or a walking-stick substituted for one is a common experiment. Nor is the delusion confined to the sense of seeing. He may be made to hear, smell, taste and feel, precisely as if the things described to him were real. It is also evident that in this state life may be destroyed by causing the subject to think himself dying, as by the delusion that he is drowning, actual asphyxia taking place almost as quickly as if he was really under water. The familiar case of the condemned criminal who was bled to death from an imaginary incision in the arm while blindfolded, shows also that a firm conviction of death is fatal. Having completed the experiments let the operator produce some pleasant scene for the last, and, after bringing the subject out of the last scene, proceed to satisfy himself and the subject that he is entirely free from the influence. Take hold of his hands and bid him to let the influence pass off. Make a few passes upwards and relax the action of the will by which he has been held in that state, until he is sure he is in his natural state. If the subject is last shown an unpleasant sight it will leave an unpleasant sensation for a long

time, perhaps at recurring intervals. Persons who have in this state been led to see serpents, and then brought out of the state without some pleasant impression succeeding that, have often started afterwards at imaginary reptiles in their path, and the same is true of illusions of wasps, bees, etc. The necessity of being thoroughly awakened or restored to the ordinary state, and completely freed from the influence of the operator, is not only to free the subject from lingering delusion, but it is observed that persons left partially under this influence grow nervous and melancholy or sentimental. If a person who has been in this state shows these symptoms, or is pale and feeble, let the operator again place him under his influence, as he can readily do after the first time, and use more care in freeing him from the influence, and the unfavorable effects will disappear. Upon the first discovery of the power being obtained over the subject the operator, if timid and unaccustomed to the experiment may feel a slight alarm, a feeling which must be controlled as it is immediately communicated to the subject. It is of the greatest importance that the operator be able to control himself, and persons not able to preserve self-control should not assume the office of operator. By watching the expression of the mouth of the subject the operator may ascertain from a relaxed expression, like that of one sleeping, when he has subdued the brain and be able to guard against carrying the influence to

excess so as to have difficulty in arousing him from this state. Let the operator beware of a smile by the subject during an experiment, and observing that, let him immediately have perfect silence, make a few passes down the spine and bring the subject into the waking state as quickly as possible; as, otherwise, symptoms might ensue which, if not dangerous, would be very alarming to an amateur, and consequently injurious. This is more likely to happen in experiments in which the sense of hearing is acted upon than in affecting delusions of the other sense.

Lastly, should any unpleasant effects result from these experiments by amateurs, let an expert be consulted, who will probably be able by himself getting control of the subject and bringing him out from under his influence, to restore the normal condition.

Dr. Caldwell gives the following directions for producing the *mesmeric sleep*.

"Let the parties be seated close to each other, face to face, the mesmerizer occupying the higher seat and the mesmerizee so accommodated as to sit at ease and in comfort, provision being made for the support of the head in case sleep is induced. Having requested the mesmerizee to dismiss, as far as practicable, all agitating and impressive feelings, thoughts and emotions, and be as tranquil as possible in mind, as well as in body, the mesmerizee gently grasps his hands, applying palm

to palm and thumb to thumb for the purpose of equalizing and identifying their temperature and condition. Continuing this for about a minute the mesmerizer lets go his grasp and removing his hands, and raising them just above the head of the mesmerizee, brings them gently down along each side of the head very softly brushing it, and places them on his shoulders. Let the hands rest there about another minute—the mesmerizer all this time looking steadily and intensely in his subject's face, and forcibly *willing* that he shall fall asleep. The hands are then to be moved from the shoulders along the arms with a very slight pressure, until they reach the hands of the mesmerizee, which are to be again grasped for four or five seconds, as before. After a few repetitions of these movements, the operator may begin his more regular passes. These he makes by raising his hands near to the face or top of his subject's head and bringing them down with a gentle sweep along the neck and breast (touching those parts not being necessary), to the ends of the subject's fingers, turning his palms outwards and widening the distance of his hands from each other as they descend. The ends of the operator's fingers may be also advantageously applied at times to the pit of the patient's stomach and held there for a short time." The passes may be continued for from ten to thirty minutes when if sleep is not induced a few passes upwards may be made to remove any partial or imperceptible effect and

further attempts postponed until another time. Should the sleep be induced the subject may be awakened by upward passes with the mesmerizer exercising his will to effect the awakening of the subject together with the consent of the mesmerizee to be awakened.

In the state of mesmeric sleep the senses of the subject are closed to all external impressions so that it is impossible to gain his attention save by the operator or persons placed by him in communication with the subject. The eye ear taste smell and touch are at the control of the operator as well as the movements of the voluntary muscles. In some cases very painful surgical operations have been performed without the knowledge of the patient yet he hears distinctly all that is said to him by the operator and sees all they point out whether real or imaginary. The reality of these effects cannot be doupted by any who have witnessed them and that it is an "ism" is only true of the theory by which Mesmer and his followers account for them. It cannot be doubted that persons have acquired considerable proficiency in the exercise of this power who have supposed it to be the effect of a fluid "Animal Magnetism" that passed from the operator to the subject. This was the belief of Mesmer and prevails to the present day among his followers. It is not surprising that with this false view of the subject mesmerism has failed to accomplish what its advocates at first predicted for it and what the remarkable character of its

phenomena seemed to warrant. For this and similar influences we are to look to the purely mental forces the *will* and the *imagination*, forces as immaterial as motion or heat and like them formerly erroneously supposed to be of the nature of fluids. When chemists discovered the true nature of the invisible gasses that they were forms of matter they erroneously assumed the same to be true of all invisible forces. As experiments and observations by scientific men have served to prove the non-existence of a fluid in the case of mesmerism they have often been led to dispute the existence of any force in the influence instead of recognising its true source, contenting themselves with the assertion that the effects were imaginary without recognizing the wonderful powers of the imagination which they exhibit.

The commission at Paris of which Benjamin Franklin was a member for investigating the claims of mesmerism, after finding that a boy blindfolded and made to believe he was to be led to a tree charged with the mesmeric fluid was thrown into the mesmeric state upon being led to another tree remote from the one operated upon made a report very unfavorable to mesmerism without finding the true cause of the phenomenon in the case which might have shown the force as active in that experiment as if he had been conducted to the other tree and made science correspond with the facts in the case.

In accordance with this view of mesmerism it is observed that in some cases persons have been mesmerised when absent from the operator* and only conscious of the influence by their sensations. Such might be the effect of a purely immaterial mental force but not of animal magnetism as generally understood. The wonderful effects produced by the use of metalic or painted wooden "Tractors" also demonstrate that for these and similar effects a firm conviction of their reality is sufficient and that imagination consciousness are correlated to fore.

There is another class of phenomena which illustrate the correlation or convertability of the mental and physical force as more strikingly than any examples yet referred to. There are many thousands of persons now living who have witnessed the feats of modern spiritualists. These persons assembled in circles by the united influence of several wills are able to produce physical effects upon material objects without the use of physical agencies. They tip tables and chairs balance them on one leg and even move them and lighter objects through the air without touching them; these phenomena are of such a wonderful character that it is not surprising that as the ancients attributed the action of the obscure forms of natural forces to spirits so persons should be bound who suppose these effects to be connected with

*See case reported by Mr. Townsend, page 307 of "Townsend's Facts" for Example.

the souls of the departed. This belief I do not accept but as its discussion is foreign to the subject I will not enter upon it but observe that here we have by the law of compensation mechanical motion a force overcoming gravity and as we have seen capable of conversion into every other form of force light heat electricity chemical affinity etc., as a *direct* result of will or mind power. Whether that will be surely attributed to the operators or as they believe to thedeparted dead is immaterial to our purposes. It is plainly the result of no physical force except will power — and will power if capable of producing that effect when exercised by the departed spirit is equally capable of producing like effects when exercised by the living. In how far this effect of the will might be aided by faith we cannot quantitatively determine yet there is no doubt a relation between the moral and the mental forces so that faith hope and charity exert a direct power over and are related to the will and other faculties of the purely mental forces at least as closely as ligh heat and motion.

The remaining feature of mesmerism and psychology which deserves notice as a means of throwing light upon the science of mental manifestations is that of clairvoyance whereby persons assume to see and as facts indicate do sometimes see or perceive independent of the ordinary sense of vision. Before proceeding to this branch of the subject it will be proper to observe more

closely the phenomena of somnambulism, to which the mesmeric state has so close a resemblance.

It has been observed that so far as memory is concerned, the individual while sleep-walking seems to be an entirely distinct personage from the same individual while awake. It further appears that persons while in this state have been known to show evidence of sight, while in a dark room, while their eyes were closed, and even when blind-folded with many folds of black silk, so as to entirely exclude the light, reading obscurely written names both familiar and unfamiliar. Now the theory of clairvoyance asserts that persons while in the mesmeric state are able to take cognizance of objects and facts by a sense of intuition quite independent of distance. Swedenborg asserts that spirits are independent of space that in the spiritual world space is unknown and that a mutual affinity of spirits with the desire for intercourse is sufficient to bring them into communication—and such is the claim of clairvoyants who claim to visit distant worlds instantaneously. The observation of facts in connection with this subject shows that those who do or who claim to possess this power are by no means infallible and would suggest, in many instances, that "dim-seeing" would be a more appropriate name than "clear-seeing," (clairvoyance.) Yet we cannot account for many facts that we observe otherwise than by

admitting that the minds of individuals may sometimes be affected by circumstances or facts of which they have no sensible perception, and by ideas in the minds of intimate friends which have not been communicated by any ordinary process, and this even when those persons are absent and remote. Of such facts are all cases of presentiments many of which are indisputable. For example read the following case reported in the Des Moines (Iowa) *Register:*

"A gentleman who is temporarily absent from home and stopping in the city, relates to us that after retiring to bed night before last, and before going to sleep, he seemed all at once to be in a room at home. Everything about the room seemed as real and tangible as if he were that moment in it. It could not be a dream, because he had never for a moment lost his consciousness. Upon a bed in the room lay his brother, apparently very pale, and leaning over the bed stood his mother in great seeming distress. All day yesterday he could not banish the incident from his mind, and last night came the sequel. He received a letter from home saying that his brother had fallen from a high window, and ever since had lain in an unconscious state in the room which he had so plainly seen the night before, and that his mother had scarcely left his bedside. We have this information from a gentleman of intelligence and a disbeliever in all spiritual manifestations."

Examples of this kind are common, and while persons are by no means equally susceptible to these presentiments, perhaps attending to what our intuitions prompt favors the frequency of such impressions as giving importance to and relating dreams induces the habit of frequent dreaming.

Among the ancients a common belief attributed all dreams to a supernatural origin and the influence of spirits. That belief science now contradicts, but that does not annihilate or change the fact that people dream. So investigation will demonstrate that presentiments when they occur are in conformity to natural laws, but will not thereby prevent their occurrence.

From our inability to perceive thoughts by our senses the investigation of the laws of mind offers greater difficulties than those of the physical world. We may conceive that as "all the rivers run into the sea yet the sea is not full" because the rivers are supplied by it; so the earth constantly receiving force from the sun and the force not being increased in the earth or diminished in the sun, must return to its solar source in some form as electric currents; we may trace the nervous influence from retrograde changes into binary compounds; but we cannot yet trace the product of the mental operation farther than we are conscious of its retention. There are facts which mightbe adduced as evidence that ideas pass from one mind to another without consciousness

of their origin or destination by the persons concerned. The nearly simultaneous discovery of new truths by different individuals is a fact of this kind and many occurrences in the life of every individual attest to the correctness of the same theory. To conform to the general laws of nature which from the analogy with the other portions of the universe must apply to thought, it must have a source and a destination, for it does not seem rational that while even the grosser elements of the universe are indestructible the highest form, the breath of the eternal Creator should be ephemeral.

We must from analogy also conclude that as matter and force are indestructible and dependent and as the laws which apply to one apply equally to the other so mind the other element of the triune should be subject to the laws of eternal persistence or economy and correlation. The brain is acted upon in the production of mental action as in that of voluntary motion and sensation and derangement of its functions from organic lesion or from reflex influence from other organs produce the remarkable phenomena of insanity wherein the mental quality in itself is unimpaired but through the imperfection of its machinery incapable of normal action.

It is evident that whatever may be true of the other qualities of mind the will is correlated to other forms of force and by its action or expenditure capable of producing them and consequently

capable of being derived from them or the equilibrium of the universe would be destroyed and perpetual motion demonstrated.

The separate functions of the mind seem also to bear relation to each other by which they are susceptible of mutual conversion into each other. Mental action directed in one channel cannot be employed in another.

The further persistence of ideas is shown by the fact that the mind of a single individual may exert an influence that shall be felt through all coming generations.

"The evil that men do lives after them."

Behold Martin Luther, Napoleon or Newton and trace the effect of their career for good or evil long after they have passed from the arena of human action.

Mind is not confined exclusively to man and higher intelligences. We may trace very close relations between the minds of brutes and of man. The senses are nearly the same, in some instances the senses being more or less acute in other animals than in man. In man the gray substance of the brain is in greater quantity in proportion to the white substance than in brutes and the brain is generally larger in proportion to the entire bulk of the body. Animals possess reason but in very limited degree. Their means of communicating ideas are also very imperfect compared with those of man. It may be well questioned whether a human mind in the body of a brute could acquire

by means of the senses and organs of the brute a higher state of perfection.

In brutes there exists some overruling agency of intelligence giving them intuitive or instinctive knowledge of such facts as it is necessary for them to know. Mind matter and force are blended in the brute creation as in man with this difference that brutes have not moral attributes and while their spirits cannot be doubted to be as immortal as any physical force at least we are not yet able to trace their origin or their destination.

From analogy we might infer that as certain animals receive crude matter and convert it into tissues suitable for the sustenance of our physical frame so the mental growth of the brute may serve some purpose for the growth of our intellects and that as there exists a complete scale in the vegetable and animal creation, from the lowest forms, to man, so each may have a purpose to serve for the higher orders in reference to the mental as well as physical constitution.

Will power or a certain influence analagous to or identical with what we recognize as mesmerism exists between man and the lower animals. It has been observed that dogs are susceptible to mental impressions from the mind of man directly. A gentleman observing his favorite dog in his study reposing quietly upon the skin of a panther his usual place of rest while attentively considering the animal was impressed with the conception of the contrast between the then quiet and undisturbed

deportment of the canine and the ferocity he would exhibit if the skin were the living animal from which it was taken and to which its appearance bore a striking resemblance when the dog immediately exhibited the greatest alarm and attacked the skin with terrible ferocity. We might question this circumstance did we not daily witness examples of the same influence that would be quite as incredible but for their familiarity. We observe many trained animals which follow implicitly the commands of their masters either by word or gesture yet will not pay the slightest attention to others. To attribute the obedience of many of these animals to a knowledge of our language sufficient to account for their accuracy in discrimination would imply the unreasonable hypothesis that animals created without the power of speech are gifted with the organ of language to an extraordinary degree.

It seems more rational to consider the impression upon the mind of the dog a direct sequence of the mental action in the mind of his master and to consider the sound or gesture only necessary as a means of attracting his attention or perhaps an auxiliary to the mental impression. How far sounds and gestures are correlated with purely mental powers in producing impressions upon the mind or inducing the peculiar state we call the mesmeric or psychological state investigation must determine. From the accounts which reach us of

the employmeut of these means by eastern charmers there is reason to believe them important aids.

The phenomena of certain dogs of delicate and sensitive nervous temperaments being able to follow the trail of men or animals are so very remarkable that without observation they might well be questioned.

This power in the dog is usually attributed to the sense of smell. It is more than the sense we possess under that name. In walking or running the vital force is eliminated from the extremities in contact with the ground and is converted like other force expended into other forms of force, As a result of this expenditure or more properly as an attendant upon this action there is an influence capable of producing an impression or sensation upon the brain of the dog. This impression is received and transmitted by nerves which ramify upon the nasal passages and has hence been attributed to odor and may be connected with an odor, although our sense of smell fails to distinguish it. This influence is eliminated from the toes in walking forwards and from the heels in walking backwards so that upon striking a trail the dog is able to determine its direction by scenting along the track backwards and forwards a few times.

The connection between men and dogs is further evinced by the effects observed upon children and invalids from associating with dogs

Invalids have from this influence recovered remarkably while the dog has pined and died. Cats are observed to decline from excessive fondling. Dogs have been known to evince wonderful intuitive knowledge of the designs of dangerous persons upon their master or protectors. Well authenticated instances are on record where favorite dogs have evinced excessive grief at the death of their masters, and even died in consequence of such bereavement. Observation has established a popular belief that impending or present evils to those with whom the dog is associated intimately, cause him to evince uneasiness and discomfiture. In regard to this and many other beliefs which are the result of observation or tradition and for which no scientific reason has yet been assigned it is more in compliance with the spirit of true scientific inquiry to seek for such an understanding of the causes and influences concerned as shall enable us to affirm the truth or fallacy of the belief than to stubbornly insist that the belief is a superstition. I have known eminent physiologists to maintain that any impression upon the mind of the mother was incapable of producing congenital marks upon the infant simply because they were ignorant of the correlation between the mental and organic forces.

All who give attention to the subject will observe that other animals no less than dogs are similarly influenced by and exert influence upon

man. Ask the hunter or fisherman whether his designs are intuitively perceived by his game or observe the effect of a serpent or even a mouse upon a delicate human temperament.

The investigation of the phenomena of mind will demonstrate that not only the laws of economy and correlation apply to it as to matter and force but likewise the other great universal law of general and triune dependence not only in itself as a union of consciousness, ideas and will but in its various forms of existence as the various types of organic life are dependent upon each other. By the application of these laws we may come to know more not only of our relations to the lower orders of creation but to each other and the higher Intelligence by whose immaterial yet all-powerful will all things were and are created and continued.

V.

HARMONY.

EVIDENCE—SCIENCE AND SUPERSTITION—BIBLE—BIGOTRY —ASTROLOGY—SOUND—FORCE—SENTIMENT—NUMBER —EMOTION—MENTAL AND MORAL QUALITIES— THE UNIVERSE.

While a distinct individuality is characteristic of every species and every individual while *exact* resemblance is a natural impossibility so that no two leaves of the forest blades of grass grains of sand insects animals or human beings of all the countless multitudes that exist have existed and shall exist, are precisely alike; while the law of variety is as universal as the law that no two bodies can occupy the same space at the same time, yet such is the dependence of all things that, in conformity with the law of harmony, each is part of one complete and perfect whole.

Every element of the universe is dependent upon this law. Nature is ever acting to effect compensation and equilibrium. Harmony of appearances is evidence, the means by which we

obtain knowledge of truth or the harmony of facts. Evidence is of every degree from slight presumption to positive certainty according as the harmony of appearances is more or less perfect. Observation and tradition have established in the popular mind many theories and beliefs for which science in its present state does not fully account. While many of these are but the result of prejudice or false tradition yet the testimony in favor of others is such as to justify further investigation before pronouncing them superstition.

The attainments of science and art have been more successful in the past than the most sanguine dared to predict. Every advance makes succeeding conquest more easy by the mutual assistance which different branches afford to each other from the dependence unity and harmony that pervades in the realm of truth as in nature.

Science should therefore ever move with accelerating velocity, and could modern scholars exercise that tireless patience and perseverance that characterized the earlier inventors most astonishing results might be speedily attained, yet superstition and bigotry ever retard its progress. Accepting theories upon insufficient evidence is fatal to advance in science.

In our judgment of former times we are apt to assume for the actors in history a character compatible with the estimate we place upon their deeds. With reference to the belief in witchcraft

in New England for instance, we are forced to assign extremely inferior reasoning powers to the people of those times or to admit that there was some actual influence exercised although doubtless attributed to a wrong source which was so remarkable as to be a just cause of alarm to men like ourselves in the power to reason and judge except in so far as superior educational advantages with the advance in scientific knowledge may give us the right to claim superiority. Is it not more reasonable to suppose that there were some remarkable manifestations as at least a partial excuse for those rigid laws upon this subject by legislators whose children and cotemporaries framed the wisest and best system of government ever devised by man? If scientists instead of disputing circumstances they can not understand would seek for their cause it is not impossible that means for producing those effects might be discovered independent of satanic agency. The operation of the mind in dreams is often such as to demonstrate that it is prepared for its part in suspending the action of gravitation upon the body and many insects appear to possess this power.

Recent observations also exhibit such a marked effect of the rays of the sun moon and stars upon terrestrial beings as to justify the study of the science of astrology. The ancients attributed the milder forms of insanity to the moon and gave the name lunacy indicating a lunar origin while

they attributed the origin of the more violent mental abberations to the sun. When we reflect that astrology ranked as a science among the most civilized of ancient nations not unworthy the attention of the most acute philosophers of those times, and observe that they were men by nature our equals and from the evidences transmitted to us but little our inferiors in culture and art there is reason to conclude that planetary and solar influence was traced by them far more extensively than by ourselves in modern times.

The fact of the worship of heavenly bodies especially the sun by a large proportion of the most civilized ancient nations also corroberates this view and argues more or less knowledge of the ideas we now recognize as new. Doubtless the ancients were acquainted with many facts which we have lost and while civilization has in its westward course just completed its first circuit of our earth we may look to the era of the commencement of its second, for a wonderful accession to its stores from the unlocking of the treasury lying now just before it where by a strange and anomalous isolation and conservation the secrets of ancient lore have been preserved in the great Mongolian race.

History shows that the successive eras are marked by prevailing mental and moral characteristics. It is even possible to predict the return of the prevalence of particular crimes to an extraordinary degree. During the years since our sun has

exhibited such remarkable phenomena of late there has been an unusual preponderance of nervous affection insanity and suicide which latter is now giving way to murder or manslaughter. Changes in the moon visibly affect the weather and no change takes place in the weather without affecting the human brain. Severe headache often disappears with the setting of the sun and various diseases herald and respond to changes in climate. Sleeping exposed to the direct rays of the moon especially in the tropics is recognized as liable to produce mental and nervous affections. The influence of that orb upon the emotions in all climates is a theme monopolized by the poets and I forbear to trespass upon their grounds.

The people of latitudes near the equator are more passionate and emotional than those more remote. They use more adjectives in their language more gestures and reflections in speaking and respond more promptly to any cause of excitement. Probably solar influence accounts for this difference as it is observed to follow the parallels of latitude independent of longitude.

Another result of no little importance to the human race from the study of the effect of light upon animal vegetable and mineral products is to be found in the aid it renders to a correct understanding of the causes and course of disease and the action of remedies. Plague pestilence and famine are often traced to super-terrestrial influence.

Dr. Mansill has observed that from the positions of the planets we may trace the cause of those changes in the weather which are observed to take place independent of the advance of the seasons for which alone astronomy can account. He argues an action among the heavenly orbs the reverse of that assigned to them and claims that instead of reflecting light and heat upon each other they draw or "rob" that influence from each other. His theories corroborated by observations are of interest to science. "Prognostics" of the weather are already advanced to a degree of accuracy which would seem miraculous to our forefathers or to savage tribes and which but a single century ago science would have considered impossible.

If the incredulity of mankind as to facts they cannot understand is remarkable their credulity as to errors promulgated upon false or insufficient evidence or deduced by false reasoning is still more astonishing. The space of this work will not suffice for the recapitulation of the false dogmas of the past or even the enumeration of those believed and taught at the present day including the doctrine of latent heat, and materialism with the theories of geologists as to the fiery contents of our earth and its antiquity.

Observation of past theories establishes a remarkable conformity between natural laws and the revealed attributes of Deity which warrants us in adding the Bible to our basis of known truths

from which to reason. Those theories which oppose Revelation are ephemeral and the pathway of science is strewn with the debris of effete myths of the imagination which in their turn have been succeeded by swarms of others destined to share a similar fate ; while discoveries in harmony with that wonderful record which Providence has furnished and perpetuated are more firmly established by each succeeding age upon the eternal basis of truth.

Harmony of force is power or efficient force while discord is inert or inefficient. Indeed harmony is not only essential to active force but it has many claims to be ranked as a distinct form of force like heat or motion. Harmony in sound is capable of producing remarkable effects. Every structure has a definite vibrating note and will respond to vibrations in unison with it. Prof. Lovering of Harvard has observed that the violent shaking of factories by machinery may be obviated by an increase or decrease of the speed so as to change the vibrating note even when that note is so low as to be imperceptible to the sense of hearing and cites the case of the violinist who threw the iron bridge at Colebrook Dale into alarming and dangerous convulsions by striking upon his violin a note in harmony with its own. I have recently seen an account of a German bar tender who amused his customers by shivering glasses with a modulation of his voice and the breaking of lamp chimneys from the same cause

is only too familiar to all. It is stated that military companies are required to cross iron bridges at route step to avoid the danger attendant upon regular marching and that the neglect of this rule broke the suspension bridge at Angiers France, and resulted in the loss of many lives. Railroad accidents are often traceable to a similar cause.

These remarkable effects of harmony of sound are only an index to the effects of harmony in other forms of force all of which are influenced by the same universal law.

Armies march farther and faster from keeping step than a single individual on the same track especially if music is also employed. Two horses will if they work in harmony start more than twice as much as one alone and the effect of will power acting as physical force when several "mediums" are united in their purpose are the most striking evidence of the law of increase by harmony. It is not easy to say precisely what constitutes perfect harmony or to what extent force is thereby increased but the general prevalence of the law of the square root in natural phenomena would lead to the presumption that forces acting in perfect harmony produce an effect equal to the square of their sum.

The increased power which the will attains as the result of united action in concert with other wills points to the law of harmony as one of the conditions affecting human powers.

Harmony of the vital function is health and

discordant action is disease. An Italian physician claims to have discovered that the nerves are susceptible of acting in different keys like the notes of the musical scale and that when they act on the same key whether high or low a pleasant equilibrium pervades but when from any cause their keys become discordant "nervousness" or irregular nervous action ensues, and he proposes to put them in tune like the keys of the piano. This theory may not be less true than that of the ancients who supposed that the heavenly orbs in their circuits produced the grandest "music of the spheres" in strains inaudible only to the ear of mortals.

We observe that from harmony of sentiment are derived not only the most pleasant emotions but greatly accelerated mental powers. It has been observed that those intellects which have achieved the grandest results on the page of history have usually belonged to men whose wives mothers or most affectionate friends were remarkable for the perfection of their characters and their devotion to their families, showing that woman by her sympathy and affection may aid in the accomplishment of the grandest results more effectually than by seeking to overreach the bounds of that sphere which nature has assigned to her and which if she deserts she detracts from the harmony of the universe and shatters into discordant and prostrated energies

those powers of man to which she should be the support and stimulus.

History also demonstrates that the strength of empires having its foundation in the family is established by harmony and union and shattered by discord.

Not only may we trace harmony in its effects upon physical force mental force sound and will power but even the highest moral qualities attest its influence. Virtue is harmony with mankind our Maker and ourselves and in following the laws of harmony we are led "beyond the grave to the boundless realms of immortality" where Revelation assures us of perfect and perpetual harmony by the appropriate figure of constant strains of sweetest music. Power, health, law, love, peace, virtue, joy, truth, and heaven are examples of harmony while their opposites are discord. Harmony of number is unity and is a law of nature in consequence of which all things unite to form trinities and those compose one complete universe.

The elements that unite to constitute harmony are individuality or difference, similarity or resemblance and adaptation or fitness by which one agent or existence supplies what is necessary to complete the others and receives from them that which is necessary to its own perfection. Thus mind matter and force unite to form the universe of nature whose various departments and Elements are capable of conversion without gain

or loss into each others forms by means of connecting links as will and motion, thereby preserving the economy or eternal persistence of all things and demonstrating the triune and general dependence of each part in consequence of which nothing can exist without all things else for when the harmony is destroyed by the removal of a single part destruction of the whole must follow and therefore all things by themselves are immaterial. Thus time space and motion harmonize to continue creation and attraction repulsion and equilibrium to produce force. Like economy dependent trinity solitary immateriality convertibility individuality and unity, harmony is a universal law and may be taken like all other universal laws as a known basis from which to reason in the extension of our knowledge from the familiar to the unknown.

Indeed harmony is entitled to be classed as the chief law of the universe to which all the others great and important as they are are merely subservient only being necessary to establish and support this " heaven's first law " and the epitome of all the laws of the universe as is love of the laws of morality.

As will power connects the physical forces with the mental powers, and motion with time and space so harmony may be presumed to be a connecting link between the universal laws and some higher conception of which it is an element, perhaps the trinity of harmony or order, truth and justice.

While we may trace the stupendous results of harmony in the grandest themes which we can contemplate and see it in its perfection not only among the elements of creation but pervading her several departments so that the animal vegetable and mineral kingdoms the solid liquid and aeriform products of the earth and countless orbs of the heavens with all their motions are characterized by difference similarity and adaptation the elements of this law, yet we may trace it like all universal laws in equal perfection among the least as well as the greatest of the Creator's works. It is a law ever active and when impaired is not destroyed but nature is at hand to restore its perfect action by the aid of other laws as when too great a degree of heat is by the aid of the law of convertability relieved through its conversion into currents of positive and negative electricity and diffused in the air or sent to the earth to go in company with the currents that have undergone similar change which are ever passing from the equator to the poles as attested by the magnetic needle and the mighty gulf stream while the heavens clap their hands and the thunders roll in glad acclaim to attest that equilibrium is established and harmony is triumphant.

This constant persistence of harmony in nature is a strong assurance of the operation of a like law in the moral world that shall eventually establish the triumph of truth and justice.

Impartiality in Deity is shown by the fact that this and other laws are not confined to great systems or individuals. Critics assert that the sounds of nature are in perfect harmony and it is certain that colors observe the same law while the most perfect harmony of design pervades the realm of creation and evinces infallible wisdom and universal care. "The same law which moulds the dew drop forms the worlds" and that which provides for the least significant object has its seat in the bosom of Omnipotence, while

"The glorious universe around,
The heavens with all their train,
Sun moon and stars are firmly bound
In one mysterious chain.

"The earth the ocean and the sky,
To form one world agree,
Where all that walk or swim or fly,
Compose one family.

"God in creation thus displays
His wisdom and his might
While all his works and all his ways
In harmony unite."

THE END.